ZEV and Near ZEV M-HDV's
CEC IEPR Hearing
John Boesel, President and CEO
April 10, 2014

Clean, Advanced Tech Trucks Reduce Fuel Usage and Related Air Pollution

1 hybrid truck provides roughly the same fuel savings as this many hybrid cars.

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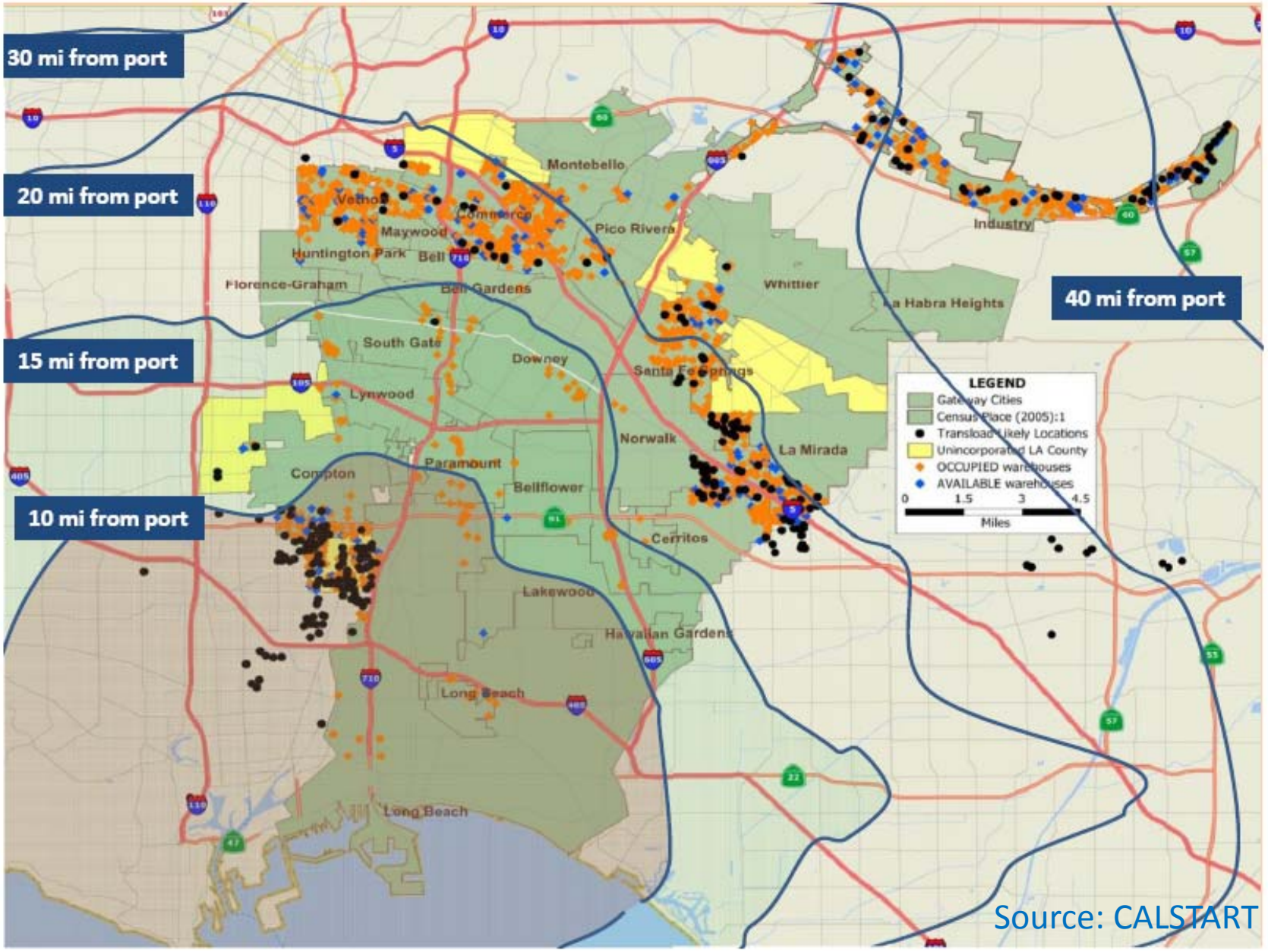
Clean Trucks: “Big Bang for the Buck”

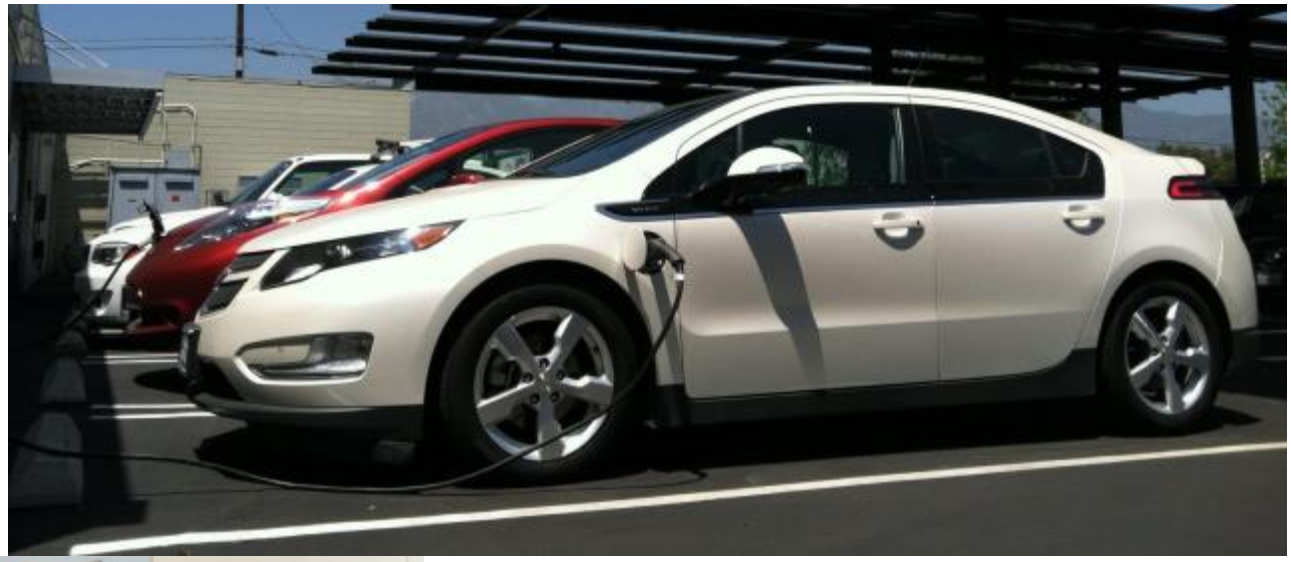
Need Zero Emission Zone, not Just Corridor



Source: CALSTART

HD ZE: Technology Option 1
Range Extended Electric Vehicle (REEV)

The "Chevy Volt of Trucks"



Status: Prototype

- Electric drive with engine backup – Natural Gas, Diesel, Turbine
- ZE much of the time; very low emissions otherwise
- CA funded demo projects

HD ZE: Technology Option 2
Battery EV (BEV)

The "Nissan Leaf of Trucks"

- Zero Emissions all the time
  - Only battery power; no engine
  - ~100 mile range per charge
- Some Smaller BEV Trucks are Available Right Now

HD ZE: Technology Option 3
Fuel Cell Range Extended EV (REEV)

The "Honda Clarity of Trucks"

- Zero Emissions all the time – hydrogen fuel with batteries
- Produces only water

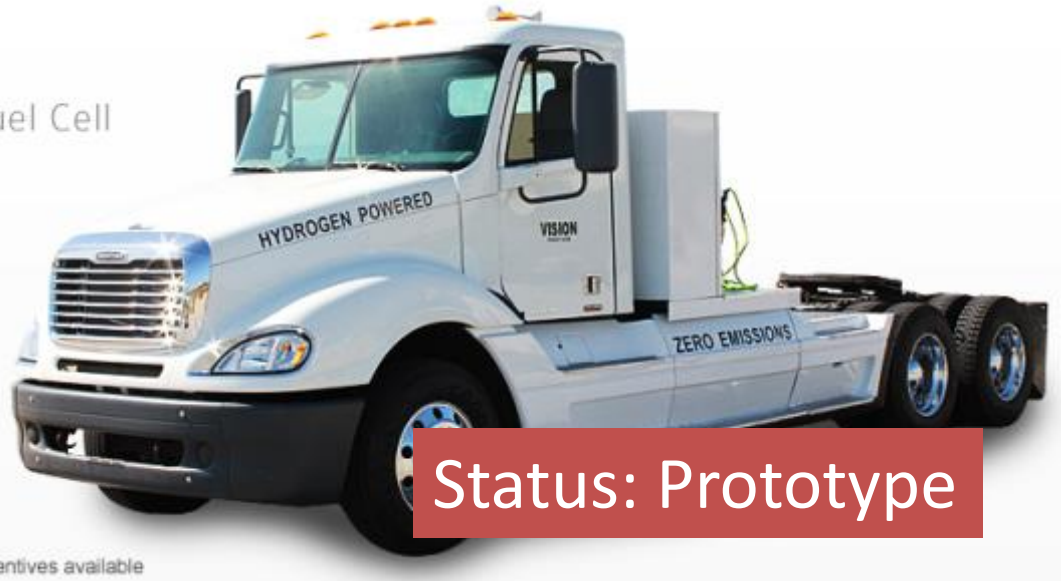
Tyrano™

The worlds 1st Hydrogen Fuel Cell powered Class 8 Truck

FEATURES:

ZERO EMISSIONS
ZERO CO2
ZERO FOSSIL FUELS
ZERO NOISE POLLUTION
ZERO CARBON FOOTPRINT

Financial Incentives: Federal tax credit and State incentives available



Status: Prototype

HD ZE: Technology Option 4
Plug-In Electric Vehicle (PHEV)

The "Ford Fusion Energi of Trucks"

Status: Prototype

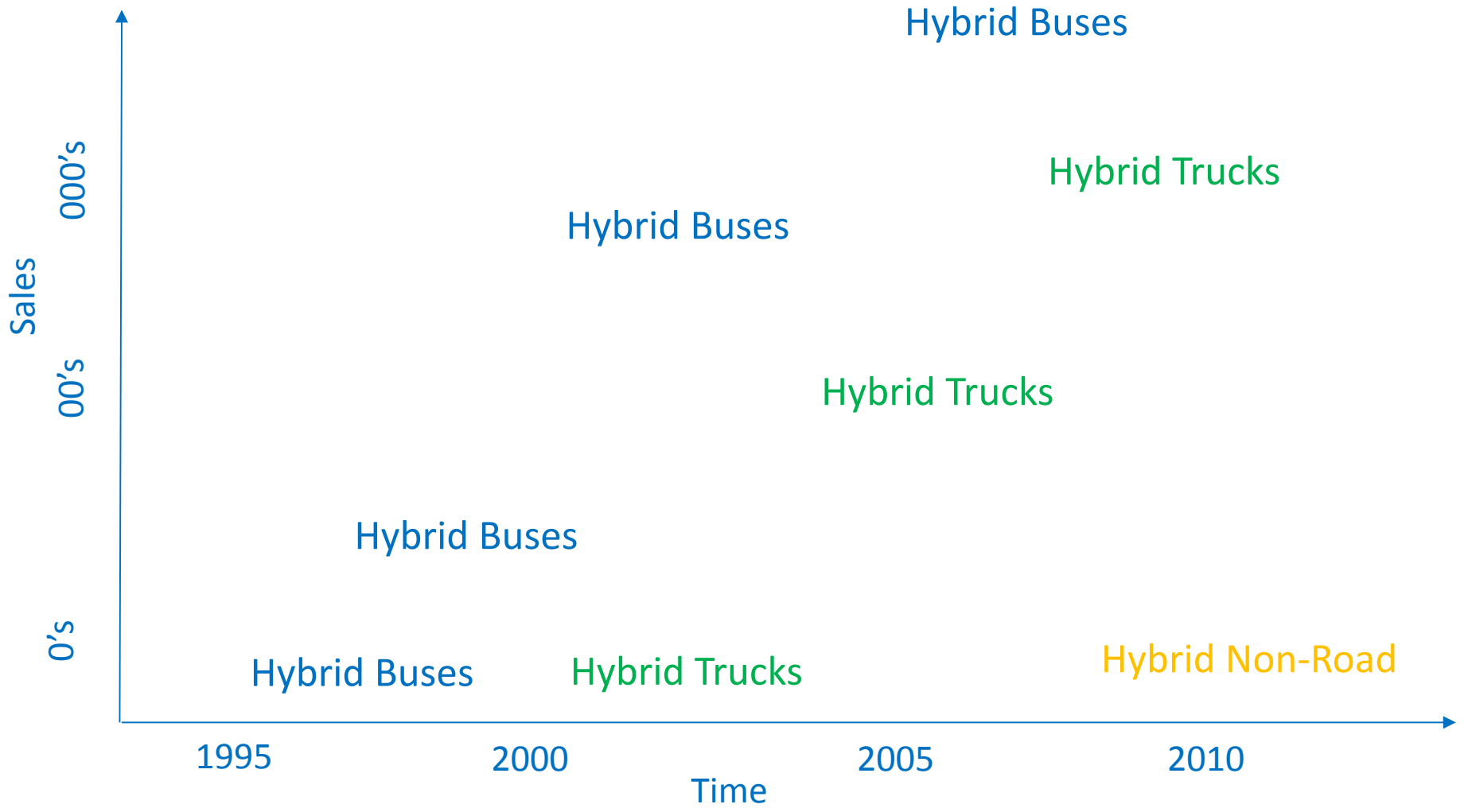
- Limited zero emission range available
- Reverts to hybrid mode after ZE range expended

Zero Emission buses are in pre-production

Similar driveline size to “big rig” trucks

Provides pathway to zero emission trucks

HDV Market Development: Transit Plays Key Role as Early Adopter



Why Aren't We Seeing More Advanced Trucks and Buses?

- **Not fully commercialized:** Technology is still new and under development with low production volumes
- **Still too expensive:** Because this is a new market, clean trucks and buses are too expensive today
- **Investment is insufficient to meet CA needs:** public and private funding for sources for R&D and purchase incentives are limited

State Investments and Policies are Needed

What Can the State Do?

Provide certainty and direction to drive private sector investment

- **Low Carbon Fuel Standard (LCFS)** improving economics for clean fuels and vehicles
- **Cap and trade** will further help cleaner tech
- **Agency efforts** (ARB, CPUC, federal EPA) also critical to creating regulatory framework

What Else Can the State Do?

Make strategic investments using cap and trade and other sources to accelerate fleet transformation

- **Technology development funding** to move from prototypes to production for zero emission big rig trucks in I-710 corridor
- **Funding for large pilot deployments** of clean trucks and buses in key areas
- **Expanded and improved incentives** for zero- and near-zero emission truck purchase through ARB programs such as HVIP, Moyer, and Prop 1B

Natural Gas Roadmap for Class 8 Trucks and Buses

- According to CalHEAT Inventory of Trucks in the Southern California & Central Regions approximately 4% of the addressable market or 7,500 class 8 Trucks and buses use natural gas
  - there is a significant growth opportunity given the addressable market of 190,000 class 8 trucks and buses in the same region
- New 11.9 Liter NG engines will spur growth in the Line haul and regional deliver segments
- Significant greenhouse gas reduction potential when fossil NG combined with renewable natural gas
  - Long-term opportunity from engine optimized to use NG